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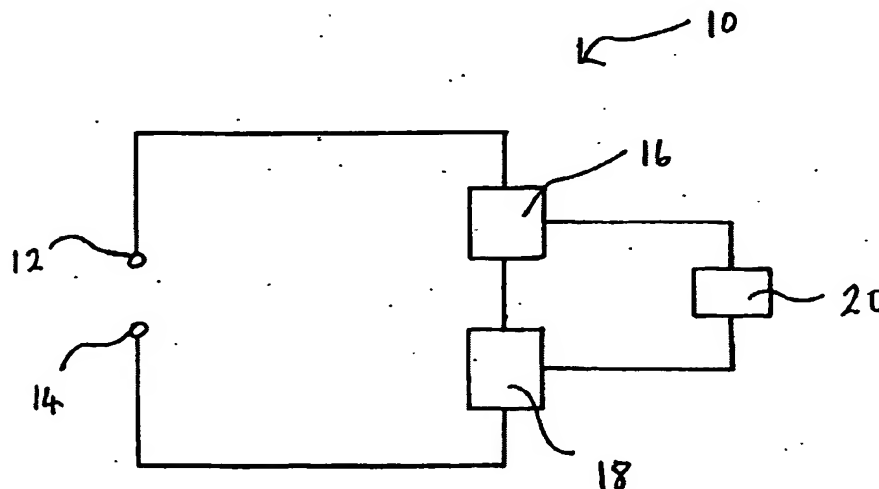
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[Continued on next page]

(54) Title: CONDUCTIVE POLYMER



(57) Abstract: This invention relates to an intrinsically conducting polymer (ICP), a plastics based electrode and a method for making such an electrode. In particular, the plastics based electrode comprises a plastic strip of cellulose acetate acting as a substrate with a thin coating of intrinsically conducting poly (3,4-ethylenedioxythiophene) and poly (4-styrenesulphonate) (i.e. PEDOT/PSS) polymer comprising an amount of vinylacetate/ethylene copolymer. The plastics based electrode may be used in apparatus for the detection of dental caries.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference PC/P12887PC	FOR FURTHER ACTION	See item 4 below
International application No. PCT/GB2004/004244	International filing date (<i>day/month/year</i>) 07 October 2004 (07.10.2004)	Priority date (<i>day/month/year</i>) 10 October 2003 (10.10.2003)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant HERIOT-WATT UNIVERSITY		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).																								
2.	This REPORT consists of a total of 8 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 30%;">Box No. I</td> <td style="width: 60%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input checked="" type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input checked="" type="checkbox"/>	Box No. VII	Certain defects in the international application	<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application
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4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. +41 22 740 14 35	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">Date of issuance of this report 10 April 2006 (10.04.2006)</td> </tr> <tr> <td style="padding: 2px;">Authorized officer Dorothee Mülhausen</td> </tr> <tr> <td style="padding: 2px;">Telephone No. +41 22 338 87 40</td> </tr> </table>	Date of issuance of this report 10 April 2006 (10.04.2006)	Authorized officer Dorothee Mülhausen	Telephone No. +41 22 338 87 40
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Authorized officer Dorothee Mülhausen				
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PATENT COOPERATION TREATY

REC'D 20 JAN 2005
WIPO PCT

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/GB2004/004244

International filing date (day/month/year)
07.10.2004

Priority date (day/month/year)
10.10.2003

International Patent Classification (IPC) or both national classification and IPC
C08L65/00, C08L81/08, C09D165/00, C09D181/08, C08L31/04, C09D131/04, A61N1/05, A61B5/053

Applicant
HERIOT-WATT UNIVERSITY

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☒ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for International preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1b/s(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2004/004244

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2004/004244

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43bis.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43bis.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. ☐ It has not been possible to consider the validity of the priority claim because a copy of the priority document was not available to the ISA at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-36
	No: Claims	
Inventive step (IS)	Yes: Claims	1-36
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-36
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/GB2004/004244

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: GHOSH S ET AL: "SUPRAMOLECULAR SELF-ASSEMBLY FOR ENHANCED CONDUCTIVITY IN CONJUGATED POLYMER BLENDS: IONIC CROSSLINKING IN BLENDS OF POLY (3,4-ETHYLENEDIOXYTHIPHENE)-POLY(STYRENESULFONATE) AND POLY (VINYLPIRROLIDONE)" ADVANCED MATERIALS, VCH VERLAGSGESELLSCHAFT, WEINHEIM, DE, vol. 10, no. 14, 1 October 1998 (1998-10-01), pages 1097-1099, XP000781871 ISSN: 0935-9648
- D2: US 2001/044492 A1 (KRESS ROBERT J ET AL) 22 November 2001 (2001-11-22)
- D3: GHOSH ET AL.: "NANO-STRUCTURED CONDUCTING POLYMER NETWORK BASED ON PEDOT-PSS" SYNTHETIC MATERIALS, vol. 121, 2001, pages 1321-1322, XP002312598

1. Claims 1-26, 29, 35-36

D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows a conducting polymer which is a blend of PEDOT/PSS with poly(vinylpyrrolidone).

The combination of the features of independent claim 1 is novel and inventive as none of the prior art documents discloses or faithfully suggests that the product obtained by adding a copolymer of vinyl acetate and ethylene to PEDOT/PSS mixtures is a intricately conductive polymer blend (Article 33(2) PCT).

Claims 2-26, 29, 35-36 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

2. Claims 27, 28

D2 is regarded as being the closest prior art to the subject-matter of claim 27 and shows a method of producing a coating of PEDOT.

The combination of the features of independent claim 27 is novel and inventive as none of the prior art documents discloses or faithfully suggests a method of producing a coating with the blend of claim 1 (Article 33(2) PCT).

Claim 28 is dependent on claim 27 and as such also meets the requirements of the PCT with respect to novelty and inventive step.

3. Claims 30-33

D3 is regarded as being the closest prior art to the subject-matter of independent claims 30, 31 and 33 and shows the use of PEDOT/PSS for the preparation of an electrode.

The combinations of the features of independent claims 30, 31 and 33 are novel and inventive as none of the prior art documents discloses or faithfully suggests the use of an electrode (coated with the blend of claim 1) in a dental apparatus, the use as an intermediate layer or in forming composite material (Article 33(2) PCT).

Claim 32 is dependent on claim 31 and as such also meets the requirements of the PCT with respect to novelty and inventive step.

Re Item VII

The technical term ITO employed in claim 31 is not generally accepted in the art, contrary to the requirements of Rule 10.1(e) PCT.

The units of resistance (k-ohm) employed in claim 19 are not additionally expressed in terms of the units stipulated by Rule 10.1/(a)/and/(b) PCT.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/GB2004/004244

Re Item VIII

The relative term "about" used in claims 2, 4, 5, 7-10, 18, 19 and 26 has no well-recognised meaning and leaves the reader in doubt as to the meaning of the technical features to which it refers, thereby rendering the definition of the subject-matter of said claims unclear (Art.6 PCT).